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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/577,902	05/01/2006	Katsuhiro Hayashi	Q94698	6016
65565 7590 09/04/2008 SUGHRUE-265550 2100 PENNSYLVANIA AVE. NW WASHINGTON, DC 20037-3213				
EXAMINER NGUYEN, VU ANH				
ART UNIT		PAPER NUMBER		
1796				
MAIL DATE		DELIVERY MODE		
09/04/2008		PAPER		

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/577,902

Applicant(s)

HAYASHI ET AL.

Examiner

Vu Nguyen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-4 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-4 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SF/88)
Paper No(s)/Mail Date 05/01/2008
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date ____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: ____

DETAILED ACTION***Claim Rejections - 35 USC § 103***

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

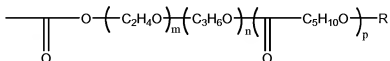
(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. Claims 1, 2, and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakajima et al. (EP 1,270,624) in view of Ishii et al. (U.S. 5,302,654).

4. Regarding claims 1, 2, and 4, claim 1 recites an aqueous ink comprising a dispersant which is a graft copolymer having M_w of 1,000-100,000 comprising a main chain made of a hydrophobic monomer and possibly other copolymerizable monomer and a polymer side chain having M_w of 300-10,000 represented by:

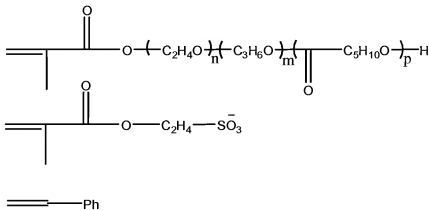


wherein $(m+n) \geq 1$, $p \geq 0$, and R is an ionic group.

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Claim 2 depends on claim 1 and further specifies the R group to be a carboxyl group, a sulfonic acid group, a phosphoric acid group, a (primary, secondary, or tertiary) amino group, or a quaternary ammonium salt group. Claim 4 specifies the side chain in claim 1 to be formed of a macromonomer.

5. Corresponding to the limitations set forth in these claims, Nakajima et al. teaches a water-based ink comprising a dispersant which is a copolymer comprising an ionic monomer, a hydrophilic polymeric monomer, and a hydrophobic monomer [0022]. The ionic monomer includes polymerizable unsaturated monomers having a quaternary ammonium salt group or sulfonic acid group [0023]. The hydrophobic monomer includes numerous methacrylates and aromatic vinyl compounds [0035]. The hydrophilic monomers include hydrogen- or alkyl-terminated polyalkylene glycol mono(meth)acrylates [0031]. The dispersant has M_w of 500-100,000 [0046]; and the polyalkylene glycol in the hydrophilic polymeric monomer has M_w of 200-3,000 [0030]. The hydrophilic macromonomers also include polycaprolactone-terminated polyethylene glycol mono(meth)acrylate [0038]. Specifically, a random copolymer comprising the following monomers is inherent in the disclosure:



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6. Clearly, the only difference between the ink disclosed by the prior art and the ink being claimed is that, whereas the claimed dispersant has the ionic group attached to the terminal end of the hydrophilic macromonomer, the disclosed dispersant has it as a constitutive structural component of the whole polymer.

7. Regarding the placement of the ionic moiety in the dispersant, Ishii et al. teaches a self-emulsifiable polymer for encapsulating a pigment *in situ* (col. 1, lines 46-57) for use in aqueous ink compositions (col. 1, line 15), wherein the polymer is a copolymer of a hydrophobic monomer such as styrene and a monomer having a carboxyl group, a sulfonic group, an amino group, or a polyoxyethylene block such as polyethylene glycol monomethacrylate (col. 2, lines 16-30). Ishii also teaches that an ionic group such as carboxylic acid group can be incorporated into a polymer by a reaction between a hydroxyl group present in the polymer with an acid anhydride (col. 2, lines 63-66).

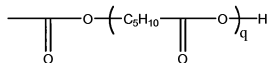
8. **[Motivations]** One having ordinary skill in the art would realize (i) that an emulsifier generally has an ionic or a hydrophilic moiety positioned at one terminal of a long hydrophobic segment, (ii) that the dispersant disclosed by Nakajima has a drawback in that the ionic groups are positioned too close to the hydrophobic backbone to encourage an enclosure of a hydrophobic pigment by the hydrophobic backbone, (iii) and that a pigment dispersed by encapsulation is more stable than by simple attachment.

9. Motivated by the aforementioned reasons and equipped with the teachings by Ishii, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to have modified the dispersant taught by Nakajima by placing

the ionic moieties at the ends of the caprolactone-terminated side chains via a reaction between the terminal hydroxyl groups with, for example, an acid anhydride so that the ionic moieties are positioned away from the hydrophobic backbone. Such modified dispersant will behave as an emulsifier that, in aqueous medium, can encapsulate a hydrophobic pigment in the hydrophobic core while the dangling ionic chains impart water solubility or dispersibility to the polymer-encapsulated pigment and, consequently, the dispersion is stable and an aqueous ink made thereof is also stable. Although the discussion here only gives an example of attaching a carboxylic acid group to the terminal end of the hydrophilic side chain, attachment of other ionic groups such as sulfonic acid group, phosphoric acid group, amino group, or tertiary ammonium salt group is well within the capability of a person having ordinary skill in the art.

10. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nakajima et al. (EP 1,270,624) in view of Kiguchi et al. (US 2002/0128351) and Ishii et al. (U.S. 5,302,654).

11. Claim 3 recites an aqueous ink similar to that in claim 1 except that the hydrophilic monomer is represented by the following structure:



wherein $q \geq 1$.

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12. Corresponding to the limitations set forth in claim 3, Nakajima teaches an aqueous ink comprising a dispersant as discussed above. However, the prior art fails to teach a dispersant having the side chain recited in claim 3.

13. Regarding the side chain in claim 3, Kiguchi et al. teaches an inkjet color filter resin composition comprising a binder resin which serves as a binder for a pigment [0046]. The binder resin comprises a carboxyl group-containing copolymer [0047]. Specifically, the copolymer includes one comprising aromatic vinyl monomers such as styrene [0051] and carboxylic acid group-terminated monomers, including the macromonomers ω -carboxy-polycaprolactone mono(meth)acrylate [0048].

14. Ishii et al. teaches, as discussed above, a self-emulsifiable polymer for encapsulating a pigment *in situ* for use in aqueous ink compositions, wherein the polymer is a copolymer of a hydrophobic monomer such as styrene and a monomer having a carboxyl group.

15. **[Motivations]** To re-state what has been discussed above, it is well known in the art that pigment dispersion by encapsulation is more stable than by simple attachment. Further, a self-emulsifiable polymer generally has ionic groups or hydrophilic groups positioned away from a hydrophobic segment to encourage encapsulation-by-emulsification process.

16. Due to the aforementioned reasons and since the copolymer disclosed by Kiguchi serves as a pigment binder while Ishii teaches that carboxyl group-terminated copolymers such as the one disclosed by Kiguchi serve as effective self-emulsifiable pigment dispersants in aqueous ink compositions, it would have been obvious to a

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person having ordinary skill in the art at the time the invention was made to have modified the dispersant taught by Nakajima by combining the ionic monomers and the hydrophilic monomers into one ionic (hydrophilic) macromonomer as taught by Kiguchi to obtain the benefits of the pigment-dispersion-by-emulsification process as taught by Ishii. Such modification not only simplifies the synthesis of the dispersant but also enables the placement of the ionic groups relatively distant from the hydrophobic segment and, thereby, results in more effective and stable pigment dispersion in an aqueous ink composition.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Vu Nguyen whose telephone number is (571)270-5454. The examiner can normally be reached on M-F 7:30-5:00 (Alternating Fridays).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Wu can be reached on 571-272-1114. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Vu Nguyen
Examiner
Art Unit 1796

/David Wu/
Supervisory Patent Examiner, Art Unit 1796